

## CLAIMS

What is claimed is:

1. A method of performing channel estimation in a wireless system

2 comprising the steps of:

receiving a signal comprising a plurality of training symbols embedded within a

4 plurality of data symbols;

estimating a plurality of training channel responses for the plurality of training

6 symbols; and

adapting an interpolator for generating a plurality of data channel responses for

8 the plurality of data symbols by interpolating the plurality of training channel responses.

2. The method of Claim 1 wherein the interpolator is adaptively modified

2 based on at least one system characteristic.

3. The method of Claim 2, further comprising the step of:

2 generating a characteristic signal based on at least one of an estimated delay

spread, an estimated Doppler spread, an estimated noise, an estimated interference, a

4 modulation order, a training tone location, a training tone density, a number of transmit

antennas, a spatial configuration of transmit antennas, and a transmit diversity mode,

6 wherein the interpolator is adaptively modified based on the characteristic signal.

4. The method of claim 1 wherein each of the plurality of training symbols  
are embedded within the plurality of data symbols over at least one of time, frequency,  
and code, further comprising the step of:

generating a data channel response for each of the plurality of data symbols by  
interpolating the plurality of training channel responses across at least one of time,  
frequency, and code.

5. The method of claim 1 further comprising the step of generating the signal  
using at least one of an orthogonal frequency division multiplex protocol, a code division  
multiplex protocol, a wavelet transform protocol, a frequency hopping protocol and a  
single carrier protocol.

6. A method of performing channel estimation in a wireless system  
comprising the steps of:

receiving a plurality of signals from a plurality of transmitters, each of the  
plurality of signals comprising a plurality of training symbols embedded within a  
corresponding plurality of data symbols;

estimating a plurality of training channel responses for each plurality of training  
symbols; and

adapting at least one interpolator for generating a plurality of data channel  
responses for each plurality of data symbols by interpolating the plurality of training  
channel responses for the corresponding plurality of training symbols.

7. The method of Claim 6 wherein at least one interpolator is adaptively  
2 modified based on at least one system characteristic.

8. The method of Claim 7, further comprising the step of generating a  
2 characteristic signal based on at least one of an estimated delay spread, an estimated  
Doppler spread, an estimated noise, an estimated interference, a modulation order, a  
4 training tone location, a training tone density, a number of transmit antennas, a spatial  
configuration of transmit antennas, and a transmit diversity mode, wherein at least one  
6 interpolator is adaptively modified based on the characteristic signal.

9. The method of claim 6 wherein each plurality of training symbols are  
2 embedded within the corresponding plurality of data symbols over at least one of time,  
frequency, and code, further comprising the step of:  
4 generating the plurality of data channel responses for each plurality of data  
symbols by interpolating the plurality of training channel responses for the corresponding  
6 plurality of training symbols across at least one of time, frequency, and code.

10. The method of claim 6 further comprising the step of generating the  
2 plurality of signals using at least one of an orthogonal frequency division multiplex  
protocol, a code division multiplex protocol, a wavelet transform protocol, a frequency  
4 hopping protocol and a single carrier protocol.

11. The method of Claim 6 further comprising the steps of separating each  
2 plurality of training symbols by at least one of time, frequency, and code.

12. A method of performing channel estimation in a wireless system

2 comprising the steps of:

receiving a signal comprising a plurality of training symbols embedded within a

4 plurality of data symbols;

estimating a plurality of training channel responses for the plurality of training

6 symbols; and

selecting at least one of a plurality of interpolators for generating a plurality of

8 data channel responses for the plurality of data symbols by interpolating the plurality of training channel responses.

13. The method of Claim 12 wherein at least one of the plurality of

2 interpolators is selected based on at least one system characteristic.

14. The method of Claim 13, further comprising the step of generating a

2 characteristic signal based on at least one of an estimated delay spread, an estimated

Doppler spread, an estimated noise, an estimated interference, a modulation order, a

4 training tone location, a training tone density, a number of transmit antennas, a spatial

configuration of transmit antennas, and a transmit diversity mode, wherein at least one of

6 the plurality of interpolators is selected based on the characteristic signal.

15. The method of claim 12 wherein each of the plurality of training symbols  
2 are embedded within the plurality of data symbols over at least one of time, frequency,  
and code, further comprising the step of:

4 generating a data channel response for each of the plurality of data symbols by  
interpolating the plurality of training channel responses across at least one of time,  
6 frequency, and code.

16. The method of claim 12 further comprising the step of generating the  
2 signal using at least one of an orthogonal frequency division multiplex protocol, a code  
division multiplex protocol, a wavelet transform protocol, a frequency hopping protocol  
4 and a single carrier protocol.

17. A method of performing channel estimation in a wireless system  
2 comprising the steps of:

receiving a plurality of signals from a plurality of transmitters, each of the  
4 plurality of signals comprising a plurality of training symbols embedded within a  
corresponding plurality of data symbols;

6 estimating a plurality of training channel responses for each plurality of training  
symbols; and

8 selecting at least one of a plurality of interpolators for generating a plurality of  
data channel responses for each plurality of data symbols by interpolating the plurality of  
10 training channel responses for the corresponding plurality of training symbols.

18. The method of Claim 17 wherein at least one of the plurality of

2 interpolators is selected based on at least one system characteristic.

19. The method of Claim 18, further comprising the step of generating a

2 characteristic signal based on at least one of an estimated delay spread, an estimated

Doppler spread, an estimated noise, an estimated interference, a modulation order, a

4 training tone location, a training tone density, a number of transmit antennas, a spatial

configuration of transmit antennas, and a transmit diversity mode, wherein at least one of

6 the plurality of interpolators is selected based on the characteristic signal.

20. The method of claim 17 wherein each plurality of training symbols are

2 embedded within the corresponding plurality of data symbols over at least one of time,

frequency, and code, further comprising the step of:

4 generating the plurality of data channel responses for each plurality of data

symbols by interpolating the plurality of training channel responses for the corresponding

6 plurality of training symbols across at least one of time, frequency, and code.

21. The method of claim 17 further comprising the step of generating the

2 plurality of signals using at least one of an orthogonal frequency division multiplex

protocol, a code division multiplex protocol, a wavelet transform protocol, a frequency

4 hopping protocol and a single carrier protocol.

22. The method of Claim 17 further comprising the step of: separating each

2 plurality of training symbols by at least one of time, frequency, and code.

23. A subscriber unit for receiving a signal comprising a plurality of training  
symbols embedded within a plurality of data symbols, the subscriber unit comprising:  
a response estimator for estimating a plurality of training channel responses for  
the plurality of training symbols; and  
an adaptive interpolator for generating a plurality of data channel responses for  
the plurality of data symbols by interpolating the plurality of training channel responses.

24. The subscriber unit of Claim 23 wherein the adaptive interpolator is  
adaptively modified based on at least one system characteristic.

25. The subscriber unit of Claim 24, further comprising a characteristic signal  
generator configured to generate a characteristic signal based on at least one of an  
estimated delay spread, an estimated Doppler spread, an estimated noise, an estimated  
interference, a modulation order, a training tone location, a training tone density, a  
number of transmit antennas, a spatial configuration of transmit antennas, and a transmit  
diversity mode, wherein the adaptive interpolator is adaptively modified based on the  
characteristic signal.

26. The subscriber unit of Claim 23 wherein each of the plurality of training  
symbols are embedded within the plurality of data symbols over at least one of time,  
frequency, and code, the adaptive interpolator being configured to generate a data  
channel response for each of the plurality of data symbols by interpolating the plurality of  
training channel responses across at least one of time, frequency, and code.

27. The subscriber unit of claim 23 wherein the signal comprises at least one

of an orthogonal frequency division multiplex protocol, a code division multiplex  
protocol, a wavelet transform protocol, a frequency hopping protocol and a single carrier  
protocol.

28. A subscriber unit for receiving a signal comprising a plurality of training

symbols embedded within a plurality of data symbols, the subscriber unit comprising:

a response estimator for estimating a plurality of training channel responses for  
the plurality of training symbols; and

a selector for selecting at least one of a plurality of interpolators for generating a  
plurality of data channel responses for the plurality of data symbols by interpolating the  
plurality of training channel responses.

29. The subscriber unit of Claim 28 wherein the selector is configured to

select at least one of the plurality of interpolators based on at least one system  
characteristic.



30. The subscriber unit of Claim 29, wherein a characteristic signal generator  
2 is configured to generate a characteristic signal based on at least one of an estimated  
delay spread, an estimated Doppler spread, an estimated noise, an estimated interference,  
4 a modulation order, a training tone location, a training tone density, a number of transmit  
antennas, a spatial configuration of transmit antennas, and a transmit diversity mode,  
6 wherein the selector is configured to generate a selection signal based on the  
characteristic signal.

31. The subscriber unit of Claim 28 wherein each of the plurality of training  
2 symbols are embedded within the plurality of data symbols over at least one of time,  
frequency, and code, the plurality of interpolators being configured to generate a data  
4 channel response for each of the plurality of data symbols by interpolating the plurality of  
training channel responses across at least one of time, frequency, and code.

32. The subscriber unit of Claim 28 wherein the signal comprises at least one  
2 of an orthogonal frequency division multiplex protocol, a code division multiplex  
protocol, a wavelet transform protocol, a frequency hopping protocol and a single carrier  
4 protocol.

33. A wireless system comprising:

a transmitter for transmitting a signal comprising a plurality of training symbols embedded within a plurality of data symbols; and

a subscriber unit comprising:

a response estimator for estimating a plurality of training channel

responses for the plurality of training symbols; and

an adaptive interpolator for generating a plurality of data channel

responses for the plurality of data symbols by interpolating the plurality of training channel responses.

34. The wireless system of Claim 33 wherein the adaptive interpolator is

adaptively modified based on at least one system characteristic.

35. The wireless system of Claim 34, further comprising a characteristic

signal generator configured to generate a characteristic signal based on at least one of an estimated delay spread, an estimated Doppler spread, an estimated noise, an estimated

interference, a modulation order, a training tone location, a training tone density, a

number of transmit antennas, a spatial configuration of transmit antennas, and a transmit

diversity mode, wherein the adaptive interpolator is adaptively modified based on the characteristic signal.

36. The wireless system of Claim 33 wherein each of the plurality of training  
symbols are embedded within the plurality of data symbols over at least one of time,  
frequency, and code, the adaptive interpolator being configured to generate a data  
channel response for each of the plurality of data symbols by interpolating the plurality of  
training channel responses across at least one of time, frequency, and code.

37. The wireless system of Claim 33 wherein the signal comprises at least one  
of an orthogonal frequency division multiplex protocol, a code division multiplex  
protocol, a wavelet transform protocol, a frequency hopping protocol and a single carrier  
protocol.

38. A wireless system comprising:

a plurality of transmitters for transmitting a plurality of signals, each of the  
plurality of signals comprising a plurality of training symbols embedded within a  
corresponding plurality of data symbols; and

a receiver comprising:

a response estimator for estimating a plurality of training channel  
responses for each plurality of training symbols; and

an adaptive interpolator for generating a plurality of data channel  
responses for each plurality of data symbols by interpolating the  
plurality of training channel responses for the corresponding  
plurality of training symbols.

39. The wireless system of Claim 38 wherein at least one interpolator is

2 adaptively modified based on at least one system characteristic.

40. The wireless system of Claim 39, further comprising a characteristic

2 signal generator configured to generate a characteristic signal based on at least one of an  
estimated delay spread, an estimated Doppler spread, an estimated noise, an estimated

4 interference, a modulation order, a training tone location, a training tone density, a

number of transmit antennas, a spatial configuration of transmit antennas, and a transmit

6 diversity mode, wherein at least one interpolator is adaptively modified based on the  
characteristic signal.

41. The wireless system of Claim 38 wherein each plurality of training

2 symbols are embedded within the corresponding plurality of data symbols over at least  
one of time, frequency, and code, the adaptive interpolator being configured to generate

4 the plurality of data channel responses for each plurality of data symbols by interpolating  
the plurality of training channel responses for the corresponding plurality of training

6 symbols across at least one of time, frequency, and code.

42. The wireless system of Claim 38 wherein the plurality of signals comprise

2 at least one of an orthogonal frequency division multiplex protocol, a code division  
multiplex protocol, a wavelet transform protocol, a frequency hopping protocol and a

4 single carrier protocol.

43. The wireless system of Claim 38 wherein the subscriber unit further  
comprises a separator configured to separate each plurality of training symbols by at least  
one of time, frequency, and code.

44. A wireless system comprising:  
a transmitter for transmitting a signal comprising a plurality of training symbols  
embedded within a plurality of data symbols; and  
a receiver comprising:  
a response estimator for estimating a plurality of training channel  
responses for the plurality of training symbols; and  
a selector for selecting at least one of a plurality of interpolators for  
generating a plurality of data channel responses for the plurality of  
data symbols by interpolating the plurality of training channel  
responses.

45. The wireless system of Claim 44 wherein the selector is configured to  
select at least one of the plurality of interpolators based on at least one system  
characteristic.

46. The wireless system of Claim 45, further comprising a characteristic  
2 signal generator configured to generate a characteristic signal based on at least one of an  
estimated delay spread, an estimated Doppler spread, an estimated noise, an estimated  
4 interference, a modulation order, a training tone location, a training tone density, a  
number of transmit antennas, a spatial configuration of transmit antennas, and a transmit  
6 diversity mode, wherein the selector is configured to generate a selection signal based on  
the characteristic signal, the selector being configured to select at least one of the  
8 plurality of interpolators based on the selection signal.

47. The wireless system of Claim 44 wherein each of the plurality of training  
2 symbols are embedded within the plurality of data symbols over at least one of time,  
frequency, and code, the selector being configured to generate a data channel response  
4 for each of the plurality of data symbols by interpolating the plurality of training channel  
responses across at least one of time, frequency, and code.

48. The wireless system of Claim 44 wherein the signal comprises at least one  
2 of an orthogonal frequency division multiplex protocol, a code division multiplex  
protocol, a wavelet transform protocol, a frequency hopping protocol and a single carrier  
4 protocol.

49. A wireless system comprising:

a plurality of transmitters for transmitting a plurality of signals, each of the plurality of signals comprising a plurality of training symbols embedded within a corresponding plurality of data symbols; and

a receiver comprising:

a response estimator for estimating a plurality of training channel responses for each plurality of training symbols; and

a selector for selecting one of a plurality of interpolators for generating a plurality of data channel responses for each plurality of data symbols by interpolating the plurality of training channel responses for the corresponding plurality of training symbols.

50. The wireless system of Claim 49 wherein at least one interpolator is selected based on at least one system characteristic.

51. The wireless system of Claim 50, further comprising a characteristic signal generator configured to generate a characteristic signal based on at least one of an estimated delay spread, an estimated Doppler spread, an estimated noise, an estimated interference, a modulation order, a training tone location, a training tone density, a number of transmit antennas, a spatial configuration of transmit antennas, and a transmit diversity mode, wherein the selector generates a selection signal based on the characteristic signal, the selector being configured to select at least one of the plurality of interpolators based on the selection signal.

52. The wireless system of Claim 49 wherein each plurality of training

2 symbols are embedded within the corresponding plurality of data symbols over at least  
one of time, frequency, and code, the plurality of interpolators being configured to  
4 generate the plurality of data channel responses for each plurality of data symbols by  
interpolating the plurality of training channel responses for the corresponding plurality of  
6 training symbols across at least one of time, frequency, and code.

53. The wireless system of Claim 49 wherein the plurality of signals comprise

2 at least one of an orthogonal frequency division multiplex protocol, a code division  
multiplex protocol, a wavelet transform protocol, a frequency hopping protocol and a  
4 single carrier protocol.

54. The wireless system of Claim 49 wherein the subscriber unit further

2 comprises a separator configured to separate each plurality of training symbols by at least  
one of time, frequency, and code.